

What is claimed is:

1 1. An aperture limiting element that has a wavelength selectivity, comprising:
2 an aperture that is an open space of a specified size formed in a substrate; and
3 in an area outside the aperture and that surrounds the aperture, a light filter is provided
4 wherein light of a specified wavelength λ_1 is transmitted, and light of a wavelength λ_2 is
5 prevented from passing straight through.

1 2. The aperture limiting element according to claim 1, wherein:
2 the light of wavelength λ_2 that is prevented from passing straight through is blocked, and
3 $\lambda_1 < \lambda_2$.

1 3. The aperture limiting element according to claim 1, wherein
2 the light of wavelength λ_2 that is prevented from passing straight through is diffracted
3 laterally, and $\lambda_1 < \lambda_2$.

1 4. The aperture limiting element according to claim 1, wherein the construction is such that the
2 difference in the optical path length of light of the first wavelength λ_1 that is transmitted by the
3 substrate and said filter versus the optical path length of light of the first wavelength λ_1 that
4 passes through the open space of said aperture is $m \cdot \lambda_1$, where m is a positive integer.

1 5. An aperture limiting element that has wavelength sensitivity comprising:
2 an aperture that is an open space of a specified size formed in a substrate;
3 in an area of the substrate that is outside the aperture, there is constructed a first light
4 filter in an inner first region that transmits light of first and second wavelengths λ_1 and λ_2 ,
5 respectively, and blocks light of a third wavelength λ_3 , where $\lambda_1 < \lambda_2 < \lambda_3$; and
6 in an area of the substrate that is outside the inner first region, there is constructed a
7 second light filter in an outer second region that transmits light of the first wavelength λ_1 and
8 blocks light of the second and third wavelengths λ_2 and λ_3 , respectively.

1 6. An aperture limiting element that has a wavelength sensitivity comprising;
2 an aperture that is an open space of a specified size formed in a substrate;
3 in an area of the substrate that is outside the aperture, there is constructed a first light
4 filter in an inner first region that transmits light of first and second wavelengths λ_1 and λ_2 ,
5 respectively, and blocks light of a third wavelength λ_3 , where $\lambda_1 < \lambda_2 < \lambda_3$; and
6 in an area of the substrate that is outside of the inner first region, there is constructed a
7 second light filter in an outer second region that transmits light of the first wavelength λ_1 , and
8 diffracts one and blocks the other of light of the second and the third wavelengths λ_2 and λ_3 ,
9 respectively.

1 7. The aperture limiting element according to claim 5, wherein the construction is such that:
2 the difference in the optical path length for light of the first wavelength λ_1 that is
3 transmitted by the substrate and said filter in said inner first region versus the optical path length
4 for light of the first wavelength λ_1 that passes through the open space of said aperture is $p \cdot \lambda_1$,
5 where p is a positive integer;
6 the difference in the optical path length for light of the first wavelength λ_1 that is
7 transmitted by the substrate and said filter in said outer second region versus the optical path
8 length for light of the first wavelength λ_1 that passes through the open space of said aperture is q
9 $\cdot \lambda_1$, where q is a positive integer; and
10 the difference in the optical path length for light of the second wavelength λ_2 that is
11 transmitted by the substrate and said filter in said inner first region versus the optical path length
12 for light of the second wavelength λ_2 that passes through the open space of said aperture is $r \cdot \lambda_2$,
13 where r is a positive integer.

1 8. The aperture limiting element according to claim 6, wherein the construction is such that:
2 the difference in the optical path length for light of the first wavelength λ_1 that is
3 transmitted by the substrate and said filter in said inner first region versus the optical path length
4 for light of the first wavelength λ_1 that passes through the open space of said aperture is $p \cdot \lambda_1$,

5 where p is a positive integer;

6 the difference in the optical path length for light of the first wavelength λ_1 that is
7 transmitted by the substrate and said filter in said outer second region versus the optical path
8 length for light of the first wavelength λ_1 that passes through the open space of said aperture is q
9 $\cdot \lambda_1$, where q is a positive integer; and

10 the difference in the optical path length for light of the second wavelength λ_2 that is
11 transmitted by the substrate and said filter in said inner first region versus the optical path length
12 for light of the second wavelength λ_2 that passes through the open space of said aperture is $r \cdot \lambda_2$,
13 where r is a positive integer.

1 9. The aperture limiting element according to claim 1, wherein the substrate has the shape of a
2 truncated cone.

1 10. The aperture limiting element according to claim 9, wherein the substrate is formed of a
2 plastic material.

1 11. The aperture limiting element according to claim 3, wherein:

2 the ratio of the intensity of the zero-order diffracted light of the first wavelength λ_1
3 divided by the light of the first wavelength λ_1 that is transmitted by the substrate is 85% or
4 higher; and

5 the ratio of the intensity of the zero-order diffracted light of the second wavelength λ_2
6 divided by the light of the second wavelength λ_2 that is transmitted by the substrate is less than
7 the ratio of the intensity of a specified diffracted order of light of the second wavelength λ_2
8 divided by the intensity of light of the second wavelength λ_2 that is transmitted by the substrate.

1 12. The aperture limiting element according to claim 3, wherein the light filter is a diffraction
2 grating having concentric circles of diffractive structures, as viewed in a direction along the
3 optical axis of the light filter.

1 13. The aperture limiting element according to claim 3, wherein the light filter is a diffraction
2 grating having diffractive structures that, in cross section, have a staircase shape.

1 14. The aperture limiting element according to claim 8, wherein the diffraction grating diffracts
2 light of the second wavelength λ_2 or of the third wavelength λ_3 in a direction that initially
3 diverges from the optical axis.

1 15. The aperture limiting element according to claim 13, wherein the diffraction grating diffracts
2 light of the second wavelength λ_2 in a direction that initially diverges from the optical axis.

1 16. An optical pickup device that includes an objective lens, an optical pickup element, and the
2 aperture limiting element according to claim 1.

1 17. An optical pickup device that includes an objective lens, an optical pickup element, and the
2 aperture limiting element according to claim 2.

1 18. An optical pickup device that includes an objective lens, an optical pickup element, and the
2 aperture limiting element according to claim 3.

1 19. An optical pickup device that includes an objective lens, an optical pickup element, and the
2 aperture limiting element according to claim 4.

1 20. An optical pickup device that includes an objective lens, an optical pickup element, and the
2 aperture limiting element according to claim 5.

1 21. An optical pickup device that includes an objective lens, an optical pickup element, and the

2 aperture limiting element according to claim 6.

1 22. The optical pickup device according to claim 16, wherein the objective lens is a positive lens
2 having a convex surface on the light-source side arranged so that the convex surface is inserted
3 into the open space of the aperture.

1 23. The aperture limiting element according to claim 5, wherein the substrate has the shape of a
2 truncated cone.

1 24. The aperture limiting element according to claim 6, wherein the substrate has the shape of a
2 truncated cone.

1 25. The aperture limiting element according to claim 23, wherein the substrate is formed of a
2 plastic material.

1 26. The aperture limiting element according to claim 24, wherein the substrate is formed of a
2 plastic material.

1 27. The aperture limiting element according to claim 6, wherein:
2 the ratio of the intensity of the zero-order diffracted light of the first wavelength λ_1
3 divided by the light of the first wavelength λ_1 that is transmitted by the substrate is 85% or
4 higher; and
5 the ratio of the intensity of the zero-order diffracted light of the second wavelength λ_2
6 divided by the light of the second wavelength λ_2 that is transmitted by the substrate is less than
7 the ratio of the intensity of a specified diffracted order of light of the second wavelength λ_2
8 divided by the intensity of light of the second wavelength λ_2 that is transmitted by the substrate.

1 28. The aperture limiting element according to claim 6, wherein the light filter is a diffraction

2 grating having concentric circles of diffractive structures, as viewed in a direction along the
3 optical axis of the light filter.

1 29. The aperture limiting element according to claim 6, wherein the light filter is a diffraction
2 grating having diffractive structures that, in cross section, have a staircase shape.

1 30. The optical pickup device according to claim 20, wherein the objective lens is a positive lens
2 having a convex surface on the light-source side arranged so that the convex surface is inserted
3 into the open space of the aperture.

1 31. The optical pickup device according to claim 21, wherein the objective lens is a positive lens
2 having a convex surface on the light-source side arranged so that the convex surface is inserted
3 into the open space of the aperture.

1 32. The aperture limiting element according to claim 29, wherein the diffraction grating diffracts
2 light of the second wavelength λ_2 or of the third wavelength λ_3 in a direction that initially
3 diverges from the optical axis.